10-1-1969

Test 1025: John Deere 5020

NEBRASKA TRACTOR TEST 1025 – JOHN DEERE 5020 DIESEL

POWER TAKE-OFF PERFORMANCE

Hp	Crank-shaft speed rpm	Fuel Consumption Gal per hr	Fuel Consumption Lb per hp-hr	Fuel Consumption Hp-hr per gal	Temperature Degrees F Cooling medium	Temperature Degrees F Air wet bulb	Temperature Degrees F Air dry bulb	Barometer inches of Mercury
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
141.34	2200	9.141	0.450	15.46	195	54	76	28.883
Standard Power Take-off Speed (1000 rpm)—One Hour								
128.51	1881	8.014	0.434	16.04	195	54	75	28.895
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
124.68	2285	8.120	0.453	15.35	185	55	75	.....
0.00	2418	2.824	.....	.....	172	55	76	.....
64.59	2362	5.304	0.571	12.18	175	54	74	.....
142.21	2199	9.202	0.450	15.45	195	55	75	.....
32.67	2389	4.075	0.868	8.02	172	56	75	.....
95.09	2325	6.671	0.488	14.25	179	54	74	.....
Av 76.54	**2330**	**6.033**	**0.548**	**12.69**	**180**	**55**	**75**	**28.897**

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank-shaft speed rpm	Slip of drivers %	Fuel Consumption Gal per hr	Fuel Consumption Lb per hp-hr	Fuel Consumption Hp-hr per gal	Temp Degrees F Cool-ing med	Temp Degrees F Air wet bulb	Temp Degrees F Air dry bulb	Barom-eter inches of Mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—4th Gear											
121.86	8582	5.33	2198	4.63	8.960	0.512	13.60	178	59	73	28.840
75% of Pull at Maximum Power—Ten Hours—4th Gear											
100.36	6673	5.64	2294	3.24	7.712	0.535	13.01	164	60	76	28.473
50% of Pull at Maximum Power—Two Hours—4th Gear											
70.18	4442	5.93	2383	2.13	6.439	0.638	10.90	155	38	41	29.215
MAXIMUM POWER WITH BALLAST											
119.77	14949	3.00	2228	10.03	2nd Gear			160	51	63	29.060
124.92	11534	4.06	2198	6.58	3rd Gear			170	55	70	29.060
126.22	8889	5.33	2199	4.67	4th Gear			172	56	75	29.000
126.02	7045	6.71	2202	3.77	5th Gear			170	58	75	28.840
124.87	5279	8.87	2198	2.77	6th Gear			170	57	72	28.840
122.24	3957	11.58	2202	2.00	7th Gear			170	58	75	28.840
MAXIMUM PULL WITHOUT BALLAST											
120.75	15362	2.95	2256	12.96	2nd Gear			170	40	46	29.130

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear

Pounds Pull	8889	9315	9639	9871	9929	9745
Horsepower	126.22	119.09	108.66	97.30	83.67	68.60
Crankshaft speed rpm	2199	1984	1757	1537	1315	1098
Miles per hour	5.33	4.79	4.23	3.70	3.16	2.64
Slip of drviers, %	4.67	5.07	5.39	5.71	5.55	5.39

TIRES, BALLAST and WEIGHT		**With Ballast**	**Without Ballast**
Rear tires	—No, size, ply & psi	Four 20.8-38; 10; 18	Four 20.8-38; 10; 18
Ballast	—Liquid	594 lb each	None
	Cast iron	None	None
Front tires	—No, size, ply & psi	Two 11.00-16; 8; 28	Two 11.00-16; 8; 28
Ballast	—Liquid	None	None
	Cast iron	None	None
Height of drawbar		25 inches	25 inches
Static weight with operator—Rear		15,105 lb	12,730 lb
	Front	4,525 lb	4,620 lb
	Total	19,630 lb	17,350 lb

Department of Agricultural Engineering

Dates of Test: October 1, 1969 to October 16, 1969

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, WATERLOO, IOWA

FUEL, OIL and TIME Fuel diesel **Cetane** 52.2 (rating taken from oil company's typical inspection data) **Specific gravity converted to 60°/60°** 0.8355 **Weight per gallon** 6.957 lb **Oil** SAE 30 **API service classification** MS-DS **To motor** 4.145 gal **Drained from motor** 3.812 gal **Transmission and final-drive lubricant** John Deere Special 303 oil **Total time engine was operated** 45½ hours.

ENGINE Make John Deere Diesel **Type** 6 cylinder vertical **Serial No** 531DRA-029865R **Crankshaft mounted** lengthwise **Rated rpm** 2200 **Bore and stroke** 4.75" x 5.00" **Compression ratio** 16.5 to 1 **Displacement** 531 cu in **Cranking system** 12 volt (two 6-volt batteries) **Lubrication** pressure **Air cleaner** dry type with replaceable paper element **Oil filter** replaceable paper element **Oil cooler** Engine coolant heat exchanger for crankcase oil and radiator for transmission and hydraulic oil **Fuel filter** screen in fuel pump, replaceable paper elements for 1st and 2nd stage **Muffler** was used **Cooling medium temperature control** dual thermostats.

CHASSIS Type standard **Serial No** T313R-026603R **Tread width** rear 60" to 120" front 64.25" to 81.50" **Wheel base** 104" **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 34.87" Vertical distance above roadway 37.66" Horizontal distance from center of rear wheel tread 0.037 to the right **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio partial range syncro mesh **Advertised speeds mph** first 1.9 second 3.0 third 4.0 fourth 5.2 fifth 6.5 sixth 8.5 seventh 10.9 eighth 17.9 reverse 3.9 and 6.3 **Clutch** double disc operated by foot pedal **Brakes** wet disc hydraulically power actuated operated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 156.5" left 156.5" (on concrete surface without brake) right 178.5" left 178.5" **Turning space diameter** (on concrete surface with brake applied) right 327" left 327" (on concrete surface without brake) right 371" left 371" **Belt pulley** 973 rpm at 1900 engine rpm diam 12" face 8.5" **Belt speed** 3060 fpm **Power take-off** 1010 rpm at 1900 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with the SAE and ASAE test code. First gear was not run as it was necessary to limit the pull in second gear because of the stability formula. Eighth gear was not run as it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1025.

L. F. LARSEN
Engineer-In-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
D. E. LANE
Board of Tractor Test Engineers

EXPLANATION OF TEST REPORT

GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

BELT OR POWER TAKE-OFF PERFORMANCE

Maximum Power and Fuel Consumption. The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

Varying Power and Fuel Consumption. Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque, ½ of the 85% torque; maximum power, ¼ and ¾ of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

Varying Power and Fuel Consumption With Ballast. Runs are made with various speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

Maximum Pull without Ballast. All added ballast is removed from the tractor. The drawbar pull is determined at slip limits of 15% for pneumatic tires or 7% for steel tracks or lugs. The tractor is operated at the fastest possible travel speed.

Varying Power and Travel Speed with Ballast. Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the **Nebraska Tractor Tests** write to the **Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.**